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UNITED STATES
DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
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PRODUCTION, EMPLOYMENT, AND OUTPUT PER MAN IN GYPSUM MINING

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ROBINSON NEWCOMB AND KNUTE PETERSON

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

PRODUCTION, EMPLOYMENT, AND OUTPUT PER MAN IN GYPSUM MINING[1]

By Robinson Newcomb and Knute Peterson[2]

Gypsum is a form of hydrated calcium sulfate ($CaSO_4.2H_2O$) which is widely distributed over the earth's surface. The two varieties worked commercially are rock gypsum and gypsite. Rock gypsum, the variety commonly mined for commercial purposes, is a relatively soft mineral having a specific gravity of about 2.3 and weighing about 150 pounds per cubic foot. The chief producing States are New York, Michigan, and Iowa. Before being used the crude gypsum is ground and generally calcined. The predominant use of gypsum is for building purposes (the manufacture of plaster), for which calcined gypsum is required. Gypsum is also used as a retarder in portland cement, as fertilizer, and for other purposes.

GYPSUM MINING

Crude gypsum is mined by two methods - underground and open-pit. Although the use of the former method predominates, open-pit mining increased in relative importance during the early twenties and contributed about two-fifths of the output during the period 1928-38.

PRODUCTION TRENDS

In 1860 about 50,000 short tons of crude gypsum were mined in the United States. Twenty-five years later production had nearly tripled; by 1903 it was over a million short tons. This sharp rise continued until 1909, when 2-1/4 million tons were produced. Output continued at relatively high levels in the decade 1910-19, although there were declines in some years. The strong upward trend, however, was resumed at the end of the World War, and in 1925 the peak yearly production in the United States - 5,678,302 short tons - was attained. Then began a period of uninterrupted decline in annual production accentuated by the collapse of building activity during the depression following 1929. By 1933 the quantity of gypsum mined was smaller than that for any year since 1905. By 1937 production recovered to 3 million tons, but in the following year it was 2,684,205 tons.

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[1] The statistics contained in this report are products of a joint study of gypsum mining that was made by the Bureau of Mines in cooperation with the WPA National Research Project, David Weintraub, Director. The study, one of a series on "Mineral Technology and Output Per Man," was prepared under the direction of O. E. Kiessling.
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[2] Senior mineral economist and mining statistician, respectively, WPA National Research Project.

EMPLOYMENT TRENDS

American gypsum mines employed fewer than 200 men in 1885, when they produced 144,000 short tons of crude gypsum. By 1911 gypsum mines afforded, when active, employment for 1,700 men, about two-thirds of whom were working at underground mines. Peak employment was reached in 1925, the record production year, when over 3,100 men were employed during active periods; in this year over three-fourths of the men were working at underground mines. The ensuing decline in employment lasted until 1935, or 2 years longer than the downward trend of production. Employment during active periods rose from less than 1,000 men in 1935 to slightly over 1,300 in 1937. The 12-percent decline in production between 1937 and 1938 was accompanied by a 15-percent decline in employment. In the latter year about four-fifths of the 1,100 men were employed at underground mines.

TRENDS IN OUTPUT PER MAN

The 190 men working at gypsum mines in 1885 produced, on the average, about 2.5 tons per man per day, or about 0.25 ton per man-hour. By 1900 output per man per day had risen to 3.3 tons, or about 0.33 ton per man-hour. Labor productivity at open-pit operations, 0.40 ton per man-hour, was about one-third greater than that at underground operations. Productivity continued to rise sharply, and in 1911 5.6 tons were produced per man-shift and 0.58 ton per man-hour. The rate of increase in output per man at underground mines from 1900 to 1911 was faster than that at open-pit mines, the figures for output per man-hour for the two types of mines being 0.56 and 0.61, respectively, for 1911.

Under conditions of expanding production, improved mechanical equipment, and advancing technical proficiency, labor productivity continued to rise. Output per man-hour rose to 0.66 ton in 1916, dropped to 0.58 ton in 1919, and began a virtually uninterrupted rise to 1.25 tons in 1930. Although 1.26 tons were produced per man-hour in 1932, the general trend was downward between 1930 and 1934; thereafter the trend was reversed, and output per man-hour increased to 1.29 tons in 1937 and to 1.40 tons in 1938.

The trends of output per man at underground and open-pit mines were dissimilar. Although output per man-hour at underground mines rose slowly and on the whole steadily from 1919 to 1932, the movement of output per man-hour at open-pit mines was somewhat erratic in the earlier years of this period and sharply upward during the later years. Thus output per man-hour at underground mines was actually greater than at open-pit mines in 1922, the levels being 0.69 ton and 0.63 ton, respectively. By 1930, 2.17 tons were being produced per man-hour at open-pit mines and 0.95 ton

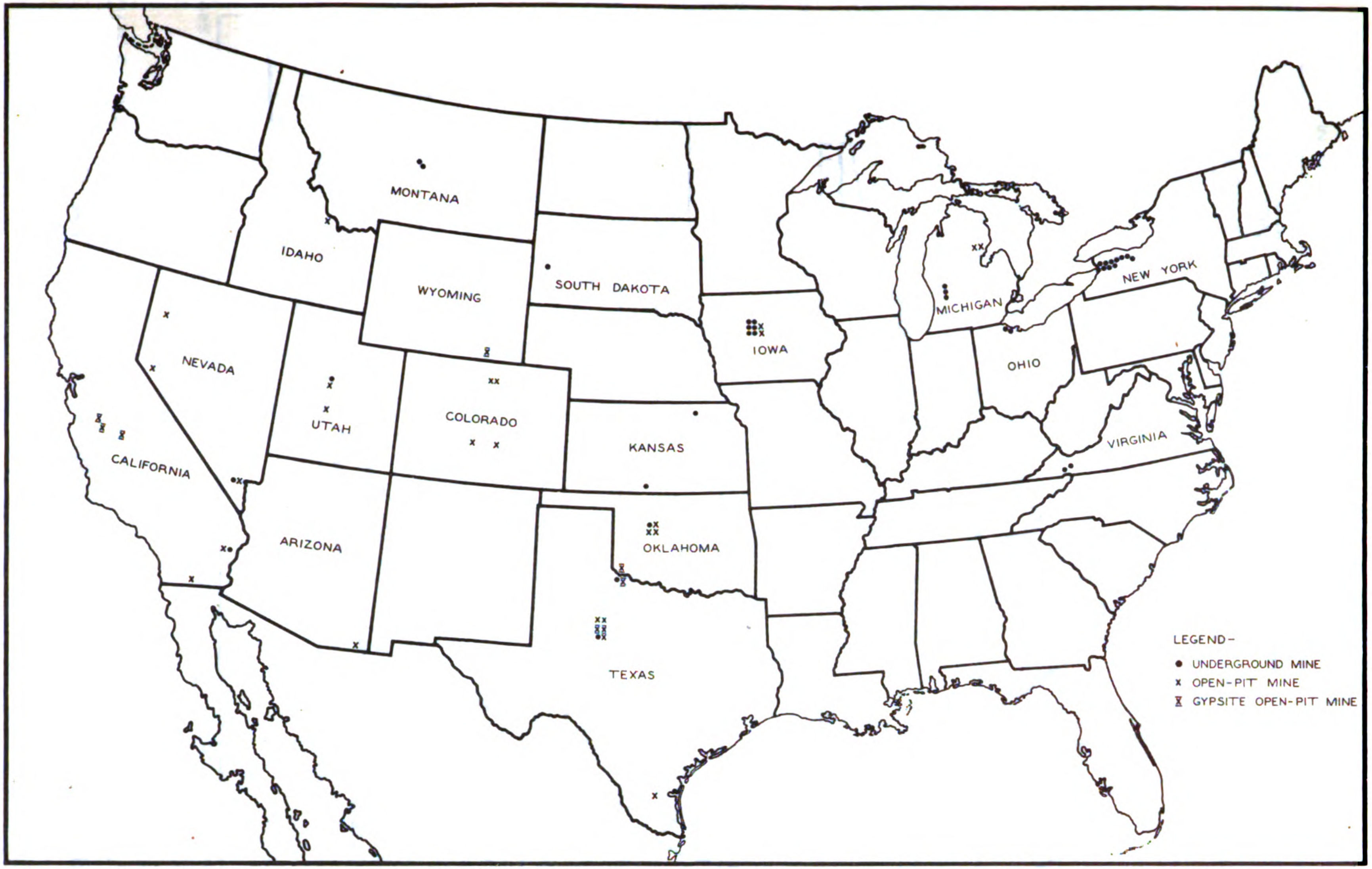

FIGURE I.- STATE DISTRIBUTION OF GYPSUM MINES, 1937.

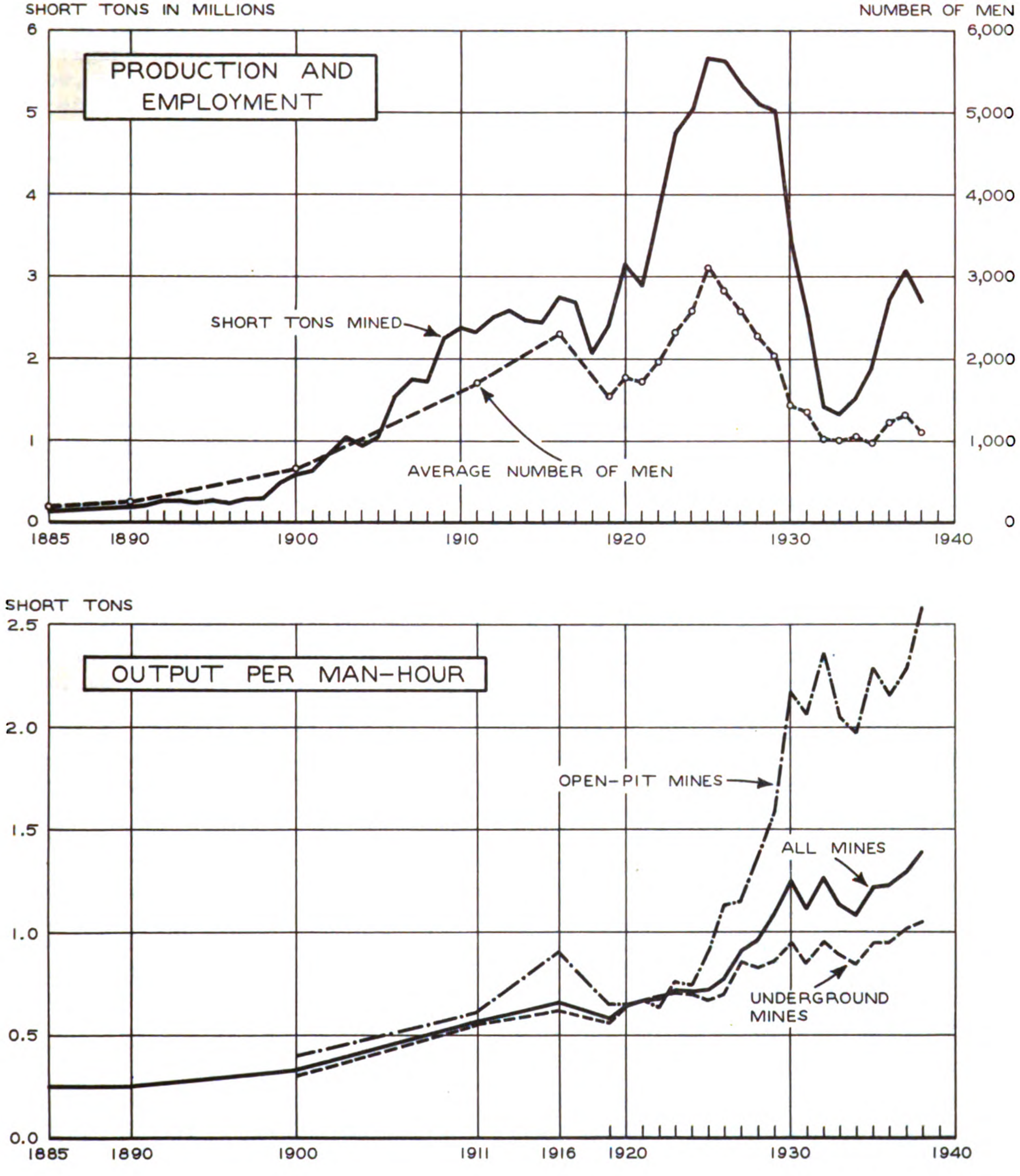

FIGURE 2.- TRENDS IN PRODUCTION, EMPLOYMENT, AND OUTPUT PER MAN AT GYPSUM MINES IN THE UNITED STATES, 1885-1938.

at underground mines. The 1930-34 decline was characteristic of both types of mines, although the 1932 figure for open-pit mines exceeded the 1930 figure by 0.19 ton. Output per man-hour at underground mines resumed a slow, steady increase in 1935, but at open-pit mines it rose in 1935, dropped in 1936, reattained the 1935 level in 1937, and rose sharply in 1938. In that year underground mines produced 1.06 tons per man-hour and open-pit mines produced 2.59 tons.

NATURE OF THE DATA

The data presented in tables that follow are based largely on statistics reported to the Bureau of Mines by operators of gypsum mines. The production and employment statistics were collected by the Bureau on separate schedules. The production figures shown for 1889-1938 cover virtually all gypsum mined in the respective years.[3] The employment statistics for 1911, 1916, and 1919-38 were obtained in the course of annual accident surveys conducted by the Bureau of Mines. These surveys covered a varying proportion of the gypsum mines. The figures for "Average number of men" represent the numbers of men working in months in which the mines were active. Man-shift figures represent, essentially, the products of average number of men and average number of days worked in a given year, although since 1922 the Bureau has been requesting man-shift statistics. Similarly, man-hour figures represent essentially the products of the number of man-shifts and the average number of hours worked per shift in a given year, although since 1932 the Bureau has been requesting man-hour statistics. The data on employment were made available for use in this report by W. W. Adams, supervising statistician, Employment Statistics Section.

To develop the statistical series on output per man it was necessary to make a special study of the production and accident-survey schedules submitted to the Bureau. By matching the production and employment data for individual mines, it was possible to obtain production statistics for those mines which were covered by the accident surveys. Production of mines included in the study amounted to over 85 percent of the total mined production in each year except 1911, when 78 percent of the production was covered, 1916, when the coverage was 67 percent, and 1924, when the coverage was 81 percent. It is believed that the productivity figures computed for mines included in the study are substantially representative of all gypsum mines. Accordingly, total employment in gypsum mining was computed by dividing employment of mines included in the study by the ratio of (a) production of mines included in the study to (b) total production.

In order to estimate trends of production, employment, and output per man for years preceding 1911, use was made of sample data available from State and other records. These estimates are believed to be more complete and accurate than any heretofore available.

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[3] These figures were published by the United States Geological Survey and the Bureau of Mines in various yearly issues of Mineral Resources of the United States or the Minerals Yearbook.

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Table 1.- PRODUCTION, EMPLOYMENT, AND OUTPUT PER MAN IN GYPSUM MINING IN THE UNITED STATES, 1860-1938

Year	Production (short tons mined[a]	Average number of men[b]	Output per man-shift[c]	Output per man-hour[a]		
				All mines	Under-ground mines	Open-pit mines
1860	50,000	-	-	-	-	-
1865	59,100	-	-	-	-	-
1870	87,200	-	-	-	-	-
1875	88,500	-	-	-	-	-
1880	137,400	-	-	-	-	-
1885	143,600	190	2.5	0.25	-	-
1889	267,769	-	-	-	-	-
1890	182,995	260	2.5	.25	-	-
1891	208,126	-	-	-	-	-
1892	256,259	-	-	-	-	-
1893	253,615	-	-	-	-	-
1894	239,312	-	-	-	-	-
1895	265,503	-	-	-	-	-
1896	224,254	-	-	-	-	-
1897	288,982	-	-	-	-	-
1898	291,638	-	-	-	-	-
1899	486,235	-	-	-	-	-
1900	594,462	650	3.3	.33	0.30	0.40
1901	633,791	-	-	-	-	-
1902	816,478	-	-	-	-	-
1903	1,041,704	-	-	-	-	-
1904	940,917	-	-	-	-	-
1905	1,043,202	-	-	-	-	-
1906	1,540,585	-	-	-	-	-
1907	1,751,748	-	-	-	-	-
1908	1,721,829	-	-	-	-	-
1909	2,252,785	-	-	-	-	-
1910	2,379,057	-	-	-	-	-
1911	2,323,970	1,700	5.6	.58	.56	.61
1912	2,500,757	-	-	-	-	-
1913	2,599,508	-	-	-	-	-
1914	2,476,465	-	-	-	-	-
1915	2,447,611	-	-	-	-	-
1916	2,757,730	2,300	6.3	.66	.62	.91
1917	2,696,226	-	-	-	-	-
1918	2,057,015	-	-	-	-	-
1919	2,420,163	1,550	5.6	.58	.56	.65
1920	3,129,142	1,770	6.1	.64	.64	.65

Table 1.- PRODUCTION, EMPLOYMENT, AND OUTPUT PER MAN IN GYPSUM MINING IN THE UNITED STATES, 1860-1938 - Continued

Year	Production (short tons mined[a]	Average number of men[b]	Output per man-shift[c]	Output per man-hour[a]		
				All mines	Under-ground mines	Open-pit mines
1921	2,890,784	1,715	6.5	0.67	0.66	0.70
1922	3,779,949	1,980	6.6	.68	.69	.63
1923	4,753,448	2,335	7.0	.72	.71	.76
1924	5,042,629	2,590	6.9	.71	.70	.74
1925	5,678,302	3,110	6.9	.77	.72	.92
1926	5,635,441	2,830	7.2	.83	.76	1.14
1927	5,346,888	2,590	7.8	.91	.86	1.15
1928	5,102,250	2,280	8.3	.96	.83	1.37
1929	5,016,132	2,045	9.6	1.09	.86	1.58
1930	3,471,393	1,445	10.6	1.25	.95	2.17
1931	2,559,017	1,365	9.4	1.11	.85	2.06
1932	1,416,274	1,020	10.1	1.26	.96	2.36
1933	1,335,192	1,005	8.9	1.13	.89	2.05
1934	1,536,170	1,065	8.3	1.08	.84	1.97
1935	1,903,880	990	9.7	1.22	.95	2.28
1936	2,712,510	1,220	9.7	1.23	.95	2.15
1937	3,058,166	1,305	10.3	1.29	1.02	2.28
1938	2,684,205	1,114	11.1	1.40	1.06	2.59

[a] For 1889-1938, from various yearly issues of Mineral Resources of the United States (U. S. Dept. Int., Geol. Survey; U. S. Dept. Com., Bur. Mines) and Minerals Yearbook (U. S. Dept. Int., Bur. Mines). For 1860-85, estimated from data available from State and other records.

[b] For 1911-38, computed from table 2 by dividing employment in mines included in study by the ratio of (a) production of mines included in study to (b) production of all mines. For 1885, 1890, and 1900, estimated from sample State data.

[c] For 1911-38, from table 2. For 1885, estimated on the basis of scattered information. For 1890, assumed to have remained constant since 1885. For 1900, based on data for 1902 contained in Special Reports of the Census Office, "Census of Mines and Quarries: 1902" (U. S. Dept. Com. and Labor, Bur. Cen., 1905).

[d] For 1911-38, from tables 2, 3, and 4. For 1900, the figure for all mines was computed from output per man-shift on the basis of a 10-hour man-shift; the figure for underground mines is based on Iowa data and that for open-pit mines is based on Michigan data, but the figures computed from State data were adjusted to represent output per man-hour for the country as a whole.

Table 2.- EMPLOYMENT, PRODUCTION, AND OUTPUT PER MAN AT GYPSUM MINES INCLUDED IN STUDY, FOR THE UNITED STATES, 1911-38, AND FOR STATES, 1925-38[a]

State and year	Mines included in study										All mines[b]	
	Number of mines	Employment					Production		Output per man (short tons)		Production (short tons)	Number of mines
		Average number of men	Average number of days worked	Man-shifts worked	Man-hours		Short tons	Percent of total	Per shift	Per hour		
					Worked	Average per man-shift						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
United States												
1911	52	1,316	246	324,316	3,122,160[c]	9.6	1,802,002	77.5	5.556	0.577	2,323,970	78
1916	27	1,054	277	291,996	2,792,328[c]	9.6	1,849,203	67.1	6.333	.662	2,757,730	65
1919	35	1,342	277	371,394	3,617,208[c]	9.7	2,093,746	86.5	5.638	.579	2,420,163	57
1920	46	1,601	288	461,253	4,431,580[c]	9.6	2,830,865	90.5	6.137	.639	3,129,142	61
1921	46	1,574	258	405,948	3,948,004[c]	9.7	2,651,577	91.7	6.532	.672	2,890,784	62
1922	44	1,797	289	519,631	5,082,250[c]	9.8	3,430,270	90.7	6.601	.675	3,779,949	64
1923	45	2,070	289	598,987	5,852,054[c]	9.8	4,218,492	88.7	7.043	.721	4,753,448	62
1924	41	2,097	282	591,338	5,770,812[c]	9.8	4,084,575	81.0	6.907	.708	5,042,629	72
1925	57	2,598	283	734,050	6,560,335	8.9	5,028,711	88.6	6.851	.767	5,678,302	70
1926	58	2,601	284	739,357	6,436,867	8.7	5,330,332	94.6	7.209	.828	5,635,441	66
1927	57	2,415	265	639,569	5,507,455	8.6	4,984,214	93.2	7.793	.905	5,346,888	67
1928	61	2,231	269	600,284	5,204,126	8.7	4,997,473	97.9	8.325	.960	5,102,250	66
1929	58	2,019	255	515,312	4,558,909	8.8	4,957,974	98.8	9.621	1.088	5,016,132	64
1930	53	1,419	226	320,069	2,730,390	8.5	3,408,480	98.2	10.649	1.248	3,471,393	59
1931	56	1,356	199	269,810	2,282,441	8.5	2,537,589	99.2	9.405	1.112	2,559,017	61
1932	54	1,000	137	137,013	1,104,071	8.1	1,390,007	98.1	10.145	1.259	1,416,274	59
1933	53	958	148	142,228	1,128,287	7.9	1,272,130	95.3	8.944	1.127	1,335,192	61
1934	52	1,023	175	178,734	1,368,926	7.7	1,477,618	96.2	8.267	1.079	1,536,170	62
1935	61	980	198	193,854	1,543,791	8.0	1,880,595	98.8	9.701	1.218	1,903,880	63
1936	64	1,220	229	279,770	2,206,176	7.9	2,712,462	100.0	9.695	1.229	2,712,510	65
1937	64	1,307	227	296,666	2,365,431	8.0	3,057,616	100.0	10.307	1.293	3,058,166	65
1938	54	1,047	217	227,706	1,808,109	7.9	2,524,145	94.0	11.085	1.396	2,684,205	63

California												
1925^{d}												
1926^{d}												
1927^{d}												
1928^{d}												
1929^{d}												
1930^{d}												
1931	3	37	205	7,594	63,260	8.3	89,949	99.0	11.845	1.422	90,899	4
1932	5	33	149	4,922	40,980	8.3	49,997	100.0	10.158	1.220	49,997	5
1933	5	33	215	7,096	55,077	7.8	56,488	98.8	7.961	1.026	57,175	6
1934	4	40	181	7,239	57,259	7.9	50,654	91.1	6.997	.885	55,620	6
1935	7	46	224	10,316	82,526	8.0	70,357	99.9	6.820	.853	70,408	8
1936	6	93	281	26,113	208,902	8.0	142,853	100.0	5.471	.684	142,853	6
1937	6	122	291	35,455	283,637	8.0	186,158	100.0	5.251	.656	186,158	6
1938	5	65	282	18,306	146,446	8.0	161,828	99.9	8.840	1.105	162,056	6
Iowa												
1925	6	264	273	72,181	577,448	8.0	793,646	99.2	10.995	1.374	800,167	7
1926	7	292	268	78,207	629,506	8.0	786,049	97.9	10.051	1.249	802,910	8
1927	6	288	243	69,927	566,736	8.1	776,961	98.1	11.111	1.371	792,159	8
1928	8	234	246	57,560	482,582	8.4	764,044	100.0	13.274	1.583	764,044	8
1929	7	187	230	42,988	355,548	8.3	717,003	99.8	16.679	2.017	718,503	8
1930	7	137	206	28,285	227,840	8.1	480,706	99.9	16.995	2.110	481,047	8
1931	7	134	162	21,749	174,102	8.0	321,627	100.0	14.788	1.847	321,627	7
1932	7	110	103	11,364	89,855	7.9	178,087	100.0	15.671	1.982	178,087	7
1933	8	122	102	12,462	101,681	8.2	172,555	100.0	13.846	1.697	172,555	8
1934	6	90	123	11,104	86,202	7.8	164,318	91.2	14.798	1.906	180,271	8
1935	7	88	144	12,684	97,688	7.7	230,203	100.0	18.149	2.357	230,203	7
1936	8	120	208	24,913	194,603	7.8	344,221	100.0	13.817	1.769	344,221	8
1937	8	138	189	26,058	207,457	8.0	387,255	100.0	14.861	1.867	387,255	8
1938	7	127	186	23,613	187,100	7.9	362,985	99.5	15.372	1.940	364,920	8
Michigan												
1925	7	281	285	79,952	736,882	9.2	649,053	100.0	8.118	.881	649,053	7
1926	6	178	276	49,213	465,558	9.5	659,685	100.0	13.405	1.417	659,685	6
1927	6	228	268	61,073	537,143	8.8	596,051	89.1	9.760	1.110	668,617	7
1928	6	173	274	47,400	427,037	9.0	677,108	100.0	14.285	1.586	677,108	6
1929	6	173	268	46,340	438,624	9.5	898,547	100.0	19.390	2.049	898,547	6

See footnotes at end of table.

Table 2.- EMPLOYMENT, PRODUCTION, AND OUTPUT PER MAN AT GYPSUM MINES INCLUDED IN STUDY, FOR THE UNITED STATES, 1911-38, AND FOR STATES, 1925-38[a] - Continued

State and year	Mines included in study										All mines[b]	
	Number of mines	Employment					Production		Output per man (short tons)		Production (short tons)	Number of mines
		Average number of men	Average number of days worked	Man-shifts worked	Man-hours		Short tons	Percent of total	Per shift	Per hour		
					Worked	Average per man-shift						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Michigan (cont.)												
1930	5	139	207	28,779	267,166	9.3	514,688	99.1	17.884	1.926	519,225	6
1931	5	100	183	18,324	152,216	8.3	379,245	99.0	20.697	2.491	383,123	6
1932	4	82	152	12,457	88,789	7.1	245,997	99.0	19.748	2.771	248,542	5
1933	4	89	136	12,085	97,805	8.1	209,388	99.1	17.326	2.141	211,392	5
1934	4	102	183	18,618	140,708	7.6	276,060	98.9	14.935	1.976	281,033	5
1935	5	98	200	19,592	153,039	7.8	342,989	100.0	17.507	2.241	342,989	5
1936	5	100	246	24,606	193,392	7.9	496,611	100.0	20.183	2.568	496,611	5
1937	5	118	243	28,694	226,466	7.9	553,242	100.0	19.281	2.443	553,242	5
1938	5	101	202	20,413	168,015	8.2	483,324	100.0	23.677	2.877	483,324	5
Nevada												
1925	4	149	288	42,865	342,920	8.0	251,420	71.8	5.865	.733	350,130	7
1926	5	180	302	54,322	434,576	8.0	311,166	88.7	5.728	.716	350,972	6
1927	5	142	276	39,213	313,704	8.0	287,483	87.8	7.331	.916	327,365	6
1928	5	129	277	35,704	285,632	8.0	238,592	85.7	6.683	.835	278,405	6
1929	4	80	294	23,513	188,104	8.0	185,755	82.4	7.900	.988	225,514	6
1930	4	58	317	18,369	146,952	8.0	158,843	96.1	8.647	1.081	165,279	5
1931	4	51	268	13,648	109.184	8.0	126,148	96.2	9.243	1.155	131,079	5
1932	4	39	209	8,135	65,083	8.0	73,594	90.9	9.047	1.131	80,938	5
1933	3	23	272	6,257	45,190	7.2	43,987	59.2	7.030	.973	74,243	5
1934	4	65	161	10,437	72,827	7.0	82,348	100.0	7.890	1.131	82,348	4
1935	4	54	254	13,724	109,791	8.0	106,894	100.0	7.789	.974	106,894	4
1936	4	48	245	11,748	93,980	8.0	167,342	100.0	14.244	1.781	167,342	4
1937	4	50	241	12,035	96,279	8.0	160,347	100.0	13.323	1.665	160,347	4
1938	4	71	218	15,467	122,404	7.9	168,515	100.0	10.895	1.377	168,515	4

New York												
1925	5	735	287	211,175	1,923,620	9.1	1,321,066	76.4	6.256	0.687	1,730,254	9
1926	8	859	292	251,077	2,070,934	8.2	1,678,882	91.6	6.288	.762	1,723,460	9
1927	9	860	269	231,386	1,953,083	8.4	1,530,122	91.3	6.613	.783	1,675,501	10
1928	11	888	263	233,897	1,949,657	8.3	1,504,826	100.0	6.434	.772	1,504,826	11
1929	11	749	255	191,308	1,658,648	8.7	1,284,338	100.0	6.713	.774	1,284,338	11
1930	10	490	232	113,556	941,912	8.3	912,070	100.0	8.032	.968	912,070	10
1931	10	522	196	102,291	873,298	8.5	744,613	100.0	7.279	.853	744,613	10
1932	9	354	149	52,608	419,548	8.0	398,192	97.5	7.569	.949	408,208	10
1933	10	325	152	49,238	398,170	8.1	363,745	100.0	7.387	.914	363,745	10
1934	10	299	170	50,847	409,889	8.1	391,408	100.0	7.698	.955	391,408	10
1935	10	287	200	57,393	463,449	8.1	485,792	100.0	8.464	1.048	485,792	10
1936	10	350	219	76,625	605,698	7.9	609,204	100.0	7.950	1.006	609,204	10
1937	10	389	210	81,622	645,580	7.9	700,357	100.0	8.580	1.085	700,357	10
1938	8	294	211	61,961	486,414	7.9	545,104	90.6	8.798	1.121	601,394	10
Ohio												
1925	4	343	267	91,591	856,399	9.4	551,479	100.0	6.021	.644	551,479	4
1926	3	270	249	67,157	617,047	9.2	521,205	100.0	7.761	.845	521,205	3
1927	3	250	246	61,466	539,434	8.8	474,320	100.0	7.717	.879	474,320	3
1928	3	188	229	42,998	363,401	8.5	413,948	100.0	9.627	1.139	413,948	3
1929	3	203	193	39,253	341,794	8.7	374,008	100.0	9.528	1.094	374,008	3
1930	3	140	168	23,462	199,706	8.5	255,337	100.0	10.883	1.279	255,337	3
1931[d]												
1932[d]												
1933[d]												
1934[d]												
1935[d]												
1936[d]												
1937[d]												
1938[d]												
Oklahoma												
1925	4	119	258	30,757	277,206	9.0	307,081	95.7	9.984	1.108	320,931	6
1926	5	119	254	30,248	302,480	10.0	315,006	97.2	10.414	1.041	324,021	6
1927	5	102	247	25,160	237,438	9.4	263,518	97.1	10.474	1.110	271,484	6
1928	5	107	296	31,683	316,830	10.0	397,752	100.0	12.554	1.255	397,752	5
1929	3	100	279	27,939	279,390	10.0	356,343	96.5	12.754	1.275	369,433	4

See footnotes at end of table.

Table 2.- EMPLOYMENT, PRODUCTION, AND OUTPUT PER MAN AT GYPSUM MINES INCLUDED IN STUDY, FOR THE UNITED STATES, 1911-38, AND FOR STATES, 1925-38[a] - Continued

State and year	Mines included in study										All mines[b]	
	Number of mines	Employment					Production		Output per man (short tons)		Produc-tion (short tons)	Number of mines
		Average number of men	Average number of days worked	Man-shifts worked	Man-hours		Short tons	Percent of total	Per shift	Per hour		
					Worked	Average per man-shift						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oklahoma (cont.)												
1930[d]												
1931[d]												
1932[d]												
1933[d]												
1934	3	57	196	11,193	83,476	7.5	92,025	87.1	8.222	1.102	105,620	5
1935	4	56	203	11,347	89,291	7.9	101,988	81.5	8.988	1.142	125,177	5
1936	5	91	241	21,967	174,729	8.0	156,544	100.0	7.126	.896	156,544	5
1937	5	92	209	19,198	154,075	8.0	159,639	100.0	8.315	1.036	159,639	5
1938	3	57	205	11,684	93,473	8.0	120,390	85.2	10.304	1.288	141,341	4
Texas												
1925	7	115	293	33,650	331,052	9.8	491,282	88.0	14.600	1.484	558,132	8
1926	6	133	296	39,410	394,100	10.0	482,119	90.4	12.233	1.223	533,156	8
1927	7	102	291	29,689	285,388	9.6	466,514	91.8	15.713	1.635	508,382	8
1928	6	86	285	24,480	245,599	10.0	466,200	91.5	19.044	1.898	509,472	8
1929	7	95	290	27,583	275,678	10.0	519,215	99.7	18.824	1.883	520,519	8
1930	6	69	212	14,603	151,745	10.4	327,191	91.1	22.406	2.156	359,315	8
1931	8	78	223	17,417	159,089	9.1	239,391	100.0	13.745	1.505	239,391	8
1932	8	76	103	7,851	72,808	9.3	110,360	100.0	14.057	1.516	110,360	8
1933	8	54	121	6,557	51,745	7.9	112,106	100.0	17.097	2.167	112,106	8
1934	8	56	153	8,545	69,976	8.2	138,326	100.0	16.188	1.977	138,326	8
1935	8	59	170	10,014	82,504	8.2	179,783	100.0	17.953	2.179	179,783	8
1936	8	67	208	13,911	111,614	8.0	257,773	100.0	18.530	2.310	257,773	8
1937	9	58	209	12,127	98,814	8.1	280,807	100.0	23.156	2.842	280,807	9
1938	8	42	237	9,916	79,491	8.0	193,240	78.2	19.448	2.431	246,990	9

Undistributed[e]												
1925	20	592	290	171,879	1,514,808	8.8	663,684	92.4	3.861	0.438	718,156	22
1926	18	570	298	169,723	1.522,686	9.0	676,220	93.9	3.984	.444	720,032	20
1927	16	443	275	121,655	1,074,529	8.8	589,245	93.7	4.844	.548	629,060	19
1928	17	426	297	126,562	1,133,388	9.0	535,003	96.1	4.227	.472	556,695	19
1929	17	432	269	116,388	1,021,123	8.8	622,765	99.6	5.351	.610	625,270	18
1930	18	386	241	93,015	795,069	8.5	759,645	97.5	8.167	.955	773,120	19
1931	19	434	205	88,787	751,292	8.5	636,616	98.2	7.170	.847	648,285	21
1932	17	306	130	39,676	327,008	8.2	333,780	98.1	8.413	1.021	340,142	19
1933	15	312	156	48,533	378,619	7.8	313,861	91.2	6.467	.829	343,970	19
1934	13	314	193	60,751	448,589	7.4	280,479	93.0	4.617	.625	301,544	16
1935	16	292	201	58,784	465,503	7.9	362,889	100.0-	6.168	.779	362,634	16
1936	18	351	228	79,887	623,258	7.8	537,914	100.0-	6.733	.863	537,962	19
1937	17	340	240	81,477	653,123	8.0	629,811	99.9	7.730	.964	630,361	18
1938	14	290	229	66,326	524,766	7.9	488,759	94.8	7.369	.931	515,665	17

[a] Compiled from records of the U. S. Department of the Interior, Bureau of Mines; mines included in the study are those for which adequately detailed and matching employment and production data are available.

[b] Includes all operations reporting production to the Bureau of Mines, and is believed to represent over 99 percent of all production.

[c] Estimated on the basis of 8 hours per man-shift in Iowa and 10 hours per man-shift in other States.

[d] Included in "Undistributed."

[e] Includes operations in Arizona; Colorado; Idaho; Kansas; Montana; New Mexico; Oregon; South Dakota; Utah; Virginia; Wyoming; California, 1925-30; Ohio, 1931-38; and Oklahoma, 1930-33.

Table 3.- EMPLOYMENT, PRODUCTION, AND OUTPUT PER MAN AT UNDERGROUND GYPSUM MINES IN THE UNITED STATES INCLUDED IN STUDY, 1911-38[a]

Year	Employment					Production		Output per man (short tons)	
	Average number of men	Average number of days worked	Man-shifts worked	Man-hours		Short tons	Percent of total included in study	Per shift	Per hour
				Worked	Average per man-shift				
1911	894	272	243,544	2,324,440[b]	9.5	1,311,172	72.8	5.384	0.564
1916	926	273	253,049	2,402,858[b]	9.5	1,496,334	80.9	5.913	.623
1919	1,056	276	291,970	2,822,968[b]	9.7	1,579,049	75.4	5.408	.559
1920	1,271	288	365,794	3,476,990[b]	9.5	2,207,001	78.0	6.033	.635
1921	1,204	253	304,122	2,929,744[b]	9.6	1,937,819	73.1	6.371	.661
1922	1,361	287	390,720	3,793,140[b]	9.7	2,620,805	76.4	6.708	.691
1923	1,660	286	474,728	4,610,364[b]	9.7	3,276,470	77.7	6.902	.711
1924	1,722	284	489,602	4,753,452[b]	9.7	3,335,965	81.7	6.814	.702
1925	2,008	284	570,194	5,028,608	8.8	3,621,923	72.0	6.352	.720
1926	2,164	284	615,040	5,265,380	8.6	4,000,532	75.1	6.505	.760
1927	2,040	265	540,112	4,563,225	8.4	3,902,344	78.3	7.225	.855
1928	1,776	263	467,907	3,931,872	8.4	3,257,358	65.2	6.962	.828
1929	1,481	246	364,553	3,111,292	8.5	2,676,052	54.0	7.341	.860
1930	1,121	221	248,233	2,064,435	8.3	1,962,537	57.6	7.906	.951
1931	1,093	195	212,883	1,790,741	8.4	1,522,876	60.0	7.154	.850
1932	787	139	109,738	869,489	7.9	837,063	60.2	7.628	.963
1933	767	147	113,026	900,578	8.0	805,313	63.3	7.125	.894
1934	788	179	140,688	1,074,717	7.6	897,013	60.7	6.376	.835
1935	777	199	154,487	1,227,964	7.9	1,161,074	61.7	7.516	.946
1936	932	230	214,086	1,684,672	7.9	1,593,404	58.7	7.443	.946
1937	1,026	227	232,923	1,851,541	7.9	1,885,921	61.7	8.097	1.019
1938	837	212	177,717	1,409,070	7.9	1,492,488	59.1	8.398	1.059

[a] Compiled from records of the U. S. Department of the Interior, Bureau of Mines; mines included in the study are those for which adequately detailed and matching employment and production data are available.

[b] Estimated on the basis of 8 hours per man-shift in Iowa and 10 hours per man-shift in other States.

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Table 4.- EMPLOYMENT, PRODUCTION, AND OUTPUT PER MAN AT OPEN-PIT GYPSUM MINES IN THE UNITED STATES INCLUDED IN STUDY, 1911-38[a]

Year	Employment					Production		Output per man (short tons)	
	Average number of men	Average number of days worked	Man-shifts worked	Man-hours		Short tons	Percent of total included in study	Per shift	Per hour
				Worked	Average per man-shift				
1911	422	191	80,772	807,720[b]	10.0	490,830	27.2	6.077	0.608
1916	128	304	38,947	389,470[b]	10.0	352,869	19.1	9.060	.906
1919	286	278	79,424	794,240[b]	10.0	514,697	24.6	6.480	.648
1920	330	289	95,459	954,590[b]	10.0	623,864	22.0	6.535	.654
1921	370	275	101,826	1,018,260[b]	10.0	713,758	26.9	7.010	.701
1922	436	296	128,911	1,289,110[b]	10.0	809,465	23.6	6.279	.628
1923	410	303	124,259	1,242,590[b]	10.0	942,022	22.3	7.581	.758
1924	375	271	101,736	1,017,360[b]	10.0	748,610	18.3	7.358	.736
1925	590	278	163,856	1,531,727	9.3	1,406,788	28.0	8.586	0.918
1926	437	291	124,317	1,171,487	9.4	1,329,800	24.9	10.697	1.135
1927	375	265	99,457	944,230	9.5	1,081,870	21.7	10.878	1.146
1928	455	291	132,377	1,272,254	9.6	1,740,115	34.8	13.145	1.368
1929	538	280	150,759	1,447,617	9.6	2,281,922	46.0	15.136	1.576
1930	298	241	71,836	665,955	9.3	1,445,943	42.4	20.128	2.171
1931	263	216	56,927	491,700	8.6	1,014,713	40.0	17.825	2.064
1932	213	128	27,275	234,582	8.6	552,944	39.8	20.273	2.357
1933	191	153	29,202	227,709	7.8	466,817	36.7	15.986	2.050
1934	235	162	38,046	294,209	7.7	580,605	39.3	15.261	1.973
1935	203	194	39,367	315,827	8.0	719,521	38.3	18.277	2.278
1936	288	228	65,684	521,504	7.9	1,119,058	41.3	17.037	2.146
1937	281	243	63,743	513,890	8.1	1,171,695	38.3	18.382	2.280
1938	210	238	49,989	399,039	8.0	1,031,657	40.9	20.637	2.585

[a] Compiled from records of the U. S. Department of the Interior, Bureau of Mines; mines included in the study are those for which adequately detailed and matching employment and production data are available. Data for gypsite operations are included.

[b] Estimated on the basis of 10 hours per man-shift.

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Table 5.- DOMESTIC PRODUCTION OF UNCALCINED GYPSUM, BY USE, 1889-1936[a]

Year	Portland cement			Agriculture			Other uses			Total		
	Short tons	Value	Average value per ton	Short tons	Value	Average value per ton	Short tons	Value	Average value per ton	Short tons	Value	Average value per ton
1889	-	-	-	108,771	$233,307	$2.14	73,243	$ 82,704	$1.13	182,014	$316,011	$1.74
1890	-	-	-	56,525	143,014	2.53	18,742	19,148	1.02	75,267	162,162	2.15
1891	-	-	-	51,700	117,356	2.27	18,574	28,690	1.54	70,274	146,046	2.08
1892	-	-	-	47,668	106,247	2.23	58,080	80,797	1.39	105,748	187,044	1.77
1893	-	-	-	50,408	106,365	2.11	42,808	71,860	1.68	93,216	178,225	1.91
1894	-	-	-	41,996	95,944	2.28	34,702	56,149	1.62	76,698	152,093	1.98
1895	-	-	-	35,079	85,355	2.43	26,624	37,837	1.42	61,703	123,192	2.00
1896	-	-	-	27,354	59,749	2.18	17,302	19,134	1.11	44,656	78,883	1.77
1897	-	-	-	31,562	67,083	2.13	23,164	27,020	1.17	54,726	94,103	1.72
1898	-	-	-	40,929	90,777	2.22	5,758	7,200	1.25	46,687	97,977	2.10
1899	-	-	-	50,033	100,797	2.01	58,352	66,762	1.14	108,385	167,559	1.55
1900	-	-	-	45,682	82,806	1.81	35,479	44,127	1.24	81,161	126,933	1.56
1901	-	-	-	59,058	109,551	1.85	68,669	71,773	1.05	127,727	181,324	1.42
1902	-	-	-	60,791	106,237	1.75	81,455	93,914	1.15	142,246	200,151	1.41
1903	-	-	-	74,601	154,945	2.08	73,912	87,608	1.19	148,513	242,553	1.63
1904	-	-	-	70,167	142,490	2.03	56,137	61,234	1.09	126,304	203,724	1.61
1905	-	-	-	40,196	74,280	1.85	67,105	106,041	1.58	107,301	180,321	1.68
1906	168,326	$400,669	$2.38	62,281	156,652	2.52	19,063	60,516	3.17	249,670	617,837	2.47
1907	194,535	355,750	1.83	46,851	115,841	2.47	38,011	68,477	1.80	279,397	540,068	1.93
1908	187,680	305,745	1.63	37,972	91,833	2.42	21,051	28,054	1.33	246,703	425,632	1.73
1909	260,433	402,830	1.55	49,581	103,695	2.09	31,841	45,984	1.44	341,855	552,509	1.62
1910	334,815	522,693	1.56	53,815	110,325	2.05	33,199	36,479	1.10	421,829	669,497	1.59
1911	327,953	484,373	1.48	52,880	97,573	1.85	6,647	7,533	1.13	387,480	589,479	1.52
1912	382,952	509,400	1.33	53,065	107,058	2.02	5,591	7,064	1.26	441,608	623,522	1.41
1913	408,221	600,913	1.47	54,815	95,953	1.75	100	200	2.00	463,136	697,066	1.51
1914	390,742	549,083	1.41	52,945	97,716	1.85	(b)	(b)	(b)	443,687	646,799	1.46
1915	406,393	528,161	1.30	69,256	122,714	1.77	(b)	(b)	(b)	475,649	650,875	1.37

1916	454,112	607,995	1.34	81,879	167,136	2.04	11,128	15,299	1.37	547,119	790,430	1.14
1917	526,881	867,123	1.65	84,366	230,808	2.74	12,748	26,439	2.07	623,995	1,124,370	1.80
1918	403,635	974,283	2.41	64,571	255,716	3.96	1,986	6,553	3.30	470,192	1,236,552	2.63
1919	470,267	1,332,637	2.83	39,978	185,566	4.64	(b)	(b)	(b)	510,245	1,518,203	2.98
1920	541,901	1,941,057	3.58	107,443	557,925	5.19	19,916	66,213	3.32	669,260	2,565,195	3.83
1921	537,978	1,775,109	3.30	104,966	490,902	4.68	(b)	(b)	(b)	642,944	2,266,011	3.52
1922	668,821	2,056,143	3.07	101,904	387,203	3.80	(b)	(b)	(b)	770,725	2,443,346	3.17
1923	821,816	2,427,410	2.95	25,426	150,026	5.90	(b)	(b)	(b)	847,242	2,577,436	3.04
1924	959,810	2,548,708	2.60	22,298	125,612	5.63	(b)	(b)	(b)	982,108	2,674,320	2.72
1925	979,154	2,604,727	2.66	26,001	153,902	5.92	8,980	64,600	7.19	1,014,135	2,823,229	2.78
1926	928,885	2,326,635	2.50	27,294	151,916	5.57	5,184	31,334	6.04	961,363	2,509,885	2.61
1927	928,307	2,237,548	2.41	29,452	129,825	4.41	7,612	21,290	2.80	965,371	2,388,663	2.47
1928	969,357	1,802,164	1.86	25,668	90,937	3.54	4,387	8,933	2.04	999,412	1,902,034	1.90
1929	1,020,234	1,914,263	1.88	38,099	161,288	4.23	7,364	21,228	2.88	1,065,697	2,096,779	1.97
1930	933,381	1,689,358	1.81	31,029	158,538	5.11	25,181	38,358	1.52	989,591	1,886,254	1.91
1931	664,305	1,266,146	1.91	28,350	138,725	4.89	80,530	160,496	1.99	773,185	1,565,367	2.02
1932	386,266	751,650	1.95	15,664	89,086	5.69	42,886	88,831	2.07	444,816	929,567	2.09
1933	376,886	669,029	1.78	11,479	63,892	5.57	32,570	73,404	2.25	420,935	806,325	1.92
1934	441,014	773,977	1.75	18,595	92,287	4.96	52,708	104,564	1.98	512,317	970,828	1.89
1935	453,706	812,694	1.79	25,703	137,298	5.34	41,185	89,987	2.18	520,594	1,039,979	2.00
1936	641,354	1,163,643	1.81	27,378	116,430	4.25	83,893	178,050	2.12	752,625	1,458,123	1.94

[a] See table 1, footnote a. Figures include data for gypsum "Sold crude" and "Ground into land plaster."

[b] Not segregated; included with data for portland cement.

Table 6.- DOMESTIC PRODUCTION OF CALCINED GYPSUM, BY USE, 1889-1936[a]

Year	Building			Manufacturing			Other uses[b]			Total		
	Short tons	Value	Average value per ton	Short tons	Value	Average value per ton	Short tons	Value	Average value per ton	Short tons	Value	Average value per ton
1889	-	-	-	-	-	-	-	-	-	64,711	$448,107	$6.92
1890	-	-	-	-	-	-	-	-	-	79,257	412,361	5.20
1891	-	-	-	-	-	-	-	-	-	110,006	482,005	4.38
1892	-	-	-	-	-	-	-	-	-	106,141	508,448	4.79
1893	-	-	-	-	-	-	-	-	-	122,937	518,390	4.22
1894	-	-	-	-	-	-	-	-	-	127,158	609,626	4.79
1895	-	-	-	-	-	-	-	-	-	150,801	674,255	4.47
1896	-	-	-	-	-	-	-	-	-	137,505	494,461	3.60
1897	-	-	-	-	-	-	-	-	-	180,935	661,761	3.66
1898	-	-	-	-	-	-	-	-	-	190,083	657,303	3.46
1899	-	-	-	-	-	-	-	-	-	286,227	1,119,521	3.91
1900	-	-	-	-	-	-	-	-	-	396,284	1,500,270	3.79
1901	-	-	-	-	-	-	-	-	-	399,686	1,325,317	3.32
1902	350,685	$1,326,262	$3.78	188,702	$562,928	$2.98	-	-	-	539,387	1,889,190	3.50
1903	478,347	2,472,103	5.17	264,196	1,078,287	4.08	-	-	-	742,543	3,550,390	4.78
1904	390,668	1,698,339	4.35	274,672	882,262	3.21	-	-	-	665,340	2,580,601	3.88
1905	-	-	-	-	-	-	-	-	-	736,708	2,848,906	3.87
1906	880,538[c]	3,142,098	3.57	(d)	(d)	(d)	19,043[e]	$78,040	$4.10	899,581	3,220,138	3.58
1907	1,060,107[c]	4,211,821	3.97	17,433	41,558	2.38	47,761	148,817	3.12	1,125,301	4,402,196	3.91
1908	1,074,229[c]	3,508,520	3.27	14,586	41,738	2.86	36,802	99,934	2.72	1,125,617	3,650,192	3.24
1909	1,441,434[c,e]	5,143,934	3.57	13,869	35,208	2.54	58,734	175,087	2.98	1,514,037	5,354,229	3.54
1910	1,483,046[c]	5,599,353	3.78	16,058	29,990	1.87	84,565	224,189	2.65	1,583,669	5,853,532	3.70
1911	1,523,263[c]	5,678,453	3.73	33,885	82,832	2.44	41,270	111,271	2.70	1,598,418	5,872,556	3.67
1912	1,678,417[c]	5,805,999	3.46	27,349	68,305	2.50	25,908	66,082	2.55	1,731,674	5,940,386	3.43
1913	1,762,046[c]	6,051,791	3.43	11,803	25,965	2.20	(f)	(f)	(f)	1,773,849	6,077,756	3.43
1914	1,655,425[c]	6,245,816	3.77	641	3,374	5.26	(f)	(f)	(f)	1,656,066	6,249,190	3.77
1915	1,601,325[c]	5,917,022	3.69	12,395	28,996	2.34	(f)	(f)	(f)	1,613,720	5,946,018	3.68

1916	1,793,616[c]	7,130,997	3.98	12,198	37,605	3.08	(f)	(f)	(f)	1,805,814	7,168,602	3.97
1917	1,662,591[c]	9,911,852	5.96	14,799	80,230	5.42	(f)	(f)	(f)	1,677,390	9,992,082	5.96
1918	1,314,702[c,e]	10,149,374	7.98	13,567	84,928	6.26	(f)	(f)	(f)	1,328,269	10,234,302	7.70
1919	1,581,343[c,e]	14,113,143	8.92	14,677	96,561	6.58	(f)	(f)	(f)	1,586,020	14,209,704	8.90
1920	1,887,116[c]	21,814,989	11.57	17,368	152,881	8.80	(f)	(f)	(f)	1,904,484	21,967,870	11.53
1921	1,386,285	17,823,949	12.86	410,566[c]	3,610,330	8.79	(f)	(f)	(f)	1,796,851	21,434,279	11.93
1922	1,967,987	22,905,425	11.64	523,278[c]	4,012,380	7.67	(f)	(f)	(f)	2,491,265	26,917,805	10.80
1923	2,469,487	27,455,443	11.12	631,891[c]	4,855,276	7.68	(f)	(f)	(f)	3,101,378	32,310,719	10.42
1924	2,754,796	34,158,279	12.40	813,773[c]	5,891,908	7.24	(f)	(f)	(f)	3,568,569	40,050,187	11.22
1925	3,255,049	38,785,958	11.92	841,308[c]	5,968,053	7.09	(f)	(f)	(f)	4,096,357	44,754,011	10.93
1926	3,251,430	38,716,725	11.91	764,544[c]	5,494,809	7.19	(f)	(f)	(f)	4,015,974	44,211,334	11.01
1927	3,298,772	35,616,762	10.80	613,439[c]	4,169,029	6.80	(f)	(f)	(f)	3,912,211	39,785,791	10.17
1928	3,447,496	28,983,564	8.41	193,889[c]	1,150,565	5.93	(f)	(f)	(f)	3,641,385	30,134,129	8.28
1929	3,125,066	27,583,813	8.83	236,514[c]	1,612,377	6.82	(f)	(f)	(f)	3,361,580	29,196,190	8.69
1930	2,024,831	23,923,370	11.81	166,545[c]	1,241,860	7.46	(f)	(f)	(f)	2,191,376	25,165,230	11.48
1931	1,516,371	18,636,847	12.29	49,280[c]	414,677	8.41	28,102	184,466	6.56	1,593,753	19,235,990	12.07
1932	832,150	11,435,319	13.74	40,806	421,200	10.32	17,540	120,200	6.85	890,495	11,976,719	13.45
1933	759,899	10,578,994	13.92	45,787	428,201	9.35	16,052	113,958	7.10	821,738	11,121,153	13.53
1934	830,119	12,068,391	14.54	62,446	625,900	10.02	9,974	96,858	9.71	902,539	12,791,149	14.17
1935	1,134,341	16,885,557	14.89	82,760	802,978	9.70	16,715	131,834	7.89	1,233,816	17,820,369	14.44
1936	1,621,401	23,768,386	14.66	100,165	897,735	8.96	9,121	98,133	10.76	1,730,687	24,764,254	14.31

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[a] See table 1, footnote a.

[b] Includes gypsum sold to other manufacturers and for other uses.

[c] Includes plaster of paris.

[d] Included in "Other uses."

[e] Includes some dental plaster.

[f] Included in "Building" and "Manufacturing."